Release notes for ENDF/B Development n-006_C_000 evaluation

April 26, 2017

- `fudge-4.0` Warnings:

  1. Cross section does not match sum of linked reaction cross sections
     crossSectionSum label 0: total (Error # 0): CS Sum.

     ```
     WARNING: Cross section does not match sum of linked reaction cross sections! Max diff: 0.64%
     ```

  2. Cross section does not match sum of linked reaction cross sections
     crossSectionSum label 1: nonelastic (Error # 0): CS Sum.

     ```
     WARNING: Cross section does not match sum of linked reaction cross sections! Max diff: 20.46%
     ```

  3. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 0 (total): / Form 'eval': (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (1.138839e-09) is too small
     ```

  4. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 1 (n + C_natural): / Form 'eval': (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (1.782031e-12) is too small
     ```

  5. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 4 (n + H1 + B_natural): / Form 'eval': (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

  6. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 5 (C_natural + gamma): / Form 'eval': (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

  7. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 6 (H1 + B_natural_s): / Form 'eval': (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

  8. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 7 (H2 + B_natural_s): / Form 'eval': (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

  9. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 8 (He4 + Be_natural_s): / Form 'eval': (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

- `fudge-4.0` Errors:

  1. Energy range of data set does not match cross section range
     reaction label 2: n + (C_natural_e2 ->He4[multiplicity:'3']) / Product: n / Distribution: / angularTwoBody - XYs2d: (Error # 0): Domain mismatch (a)

     ```
     WARNING: Domain doesn't match the cross section domain: (8296000.0 -> 150000000.0) vs (8296200.0 -> 150000000.0)
     ```

  2. Calculated and tabulated Q values disagree.
     reaction label 13: n + (C_natural_c ->He4[multiplicity:'3']) (Error # 0): Q mismatch

     ```
     WARNING: Calculated and tabulated Q-values disagree: 0. eV vs -7.275e6 eV!
     ```

  3. Calculated and tabulated Q values disagree.
     reaction label 14: n + H1 + B_natural (Error # 0): Q mismatch

     ```
     WARNING: Calculated and tabulated Q-values disagree: 170718308.4752369 eV vs -1.5957e7 eV!
     ```

  4. ZA doesn't balance for this reaction
     reaction label 14: n + H1 + B_natural (Error # 1): ZA imbalance

     ```
     WARNING: ZA doesn't balance for this reaction!
     ```

  5. Calculated and tabulated Q values disagree.
     reaction label 15: C_natural + gamma (Error # 0): Q mismatch

     ```
     WARNING: Calculated and tabulated Q-values disagree: 939565364.4173622 eV vs 4946380. eV!
     ```

  6. ZA doesn't balance for this reaction
     reaction label 15: C_natural + gamma (Error # 1): ZA imbalance

     ```
     WARNING: ZA doesn't balance for this reaction!
     ```

  7. Primary gamma energy at threshold should be $\leq$ available energy (depending on which discrete level it ends up in)
     reaction label 15: C_natural + gamma / Product: gamma__a / Distribution: / uncorrelated - energy - primaryGamma: (Error # 0): primaryGammaEnergyTooLarge

     ```
     WARNING: Primary gamma energy 4946500.0 exceeds available energy by 100.002426017%
     ```

  8. Calculated and tabulated Q values disagree.
     reaction label 16: H1 + B_natural_s (Error # 0): Q mismatch

     ```
     WARNING: Calculated and tabulated Q-values disagree: 1110283672.892599 eV vs -1.2588e7 eV!
     ```

  9. Calculated and tabulated Q values disagree.
     reaction label 17: H2 + B_natural_s (Error # 0): Q mismatch

     ```
     WARNING: Calculated and tabulated Q-values disagree: 172935682.7818356 eV vs -1.3733e7 eV!
     ```

  10. ZA doesn't balance for this reaction
      reaction label 17: H2 + B_natural_s (Error # 1): ZA imbalance

      ```
      WARNING: ZA doesn't balance for this reaction!
      ```

11. Calculated and tabulated Q values disagree.
reaction label 18: He4 + Be_natural_s (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: -4677817.246079445 eV vs -5.702e6 eV!
```

12. ZA doesn't balance for this reaction
reaction label 18: He4 + Be_natural_s (Error # 1): ZA imbalance

```
WARNING: ZA doesn't balance for this reaction!
```

- `njoy2012` Warnings:

1. This nuclide has no URR and NJOY is upset about it
unresr...calculation of unresolved resonance cross sections (0): No URR

```
 ---message from unresr---mat  600 has no resonance parameters
                           copy as is to nout
```

2. This nuclide has no URR and NJOY is upset about it
purr...probabalistic unresolved calculation (0): No URR

```
 ---message from purr---mat  600 has no resonance parameters
                           copy as is to nout
```

3. With the advent of the ENDF-6 format, it is possible to make evaluations that fully describe all the products of a nuclear reaction. Some carry-over evaluations from earlier ENDF/B versions also have this capability, but many do not. This message is intended to goad evaluators to improve things!
groupr...compute self-shielded group-averaged cross-sections (0): GROUPR/conver (0)

```
 ---message from conver---cannot do complete particle production for mt= 28
                           only mf4/mf5 provided
```

4. With the advent of the ENDF-6 format, it is possible to make evaluations that fully describe all the products of a nuclear reaction. Some carry-over evaluations from earlier ENDF/B versions also have this capability, but many do not. This message is intended to goad evaluators to improve things!
groupr...compute self-shielded group-averaged cross-sections (1): GROUPR/conver (0)

```
 ---message from conver---cannot do complete particle production for mt= 91
                           only mf4/mf5 provided
```

5. There is bad Kalbach parameter (r(E) or otherwise)
check...ace consistency check (0): ACER/check energy distributions (0)

```
 check energy distributions
   consis: ep.gt.epmax 8.509482E-12 with q.lt.0 for (n,x) at e  1.000000E-11 -> 1.000000E-11
```

6. There is bad Kalbach parameter (r(E) or otherwise)
check...ace consistency check (1): ACER/check energy distributions (0)

```
 check energy distributions
   consis:   awr.lt.180---this is probably an error.
```

7. There is bad Kalbach parameter (r(E) or otherwise)
check...ace consistency check (2): ACER/check energy distributions (0)

```
check energy distributions
  consis: shifting eprimes greater than epmax and renorming the distribution
```

- `acelst` Warnings:

  1. The incident energy grid is not monotonic for this angular distribution
     0: Bad Ang. Dist.

```
ACELST WARNING - Processing Ang.Dist.MT         2
                 E-grid non-monotonic   2.000000000E+01 2.000000000E+01
```

- `xsectplotter` Errors:

  1. Exception IndexError was thrown
     /usr/local/lib/python2.7/site-packages/matplotlib-1.5.3-py2.7-linux-x86_64.egg/matplotlib/font_manager.py:2
     UserWarning: Matplotlib is building the font cache using fc-list. This may take a moment. (Error # 2): IndexError

```
IndexError: index out of range
```